DOCUMENT RESUME

ED 451 065 SE 064 627

AUTHOR Tracy, Dyanne M.; Fanelli, Beverly H.
TITLE Teaching Money Concepts: Are We Shortchanging Our Kids?
PUB DATE 2000-00-00
NOTE 16p.; Contains color picture that probably will not photograph well.
PUB TYPE Reports - Research (143)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Manipulative Materials; Mathematics Instruction; *Monetary Systems; Primary Education; Teaching Methods; *Visualization
IDENTIFIERS Money

ABSTRACT

Most primary teachers struggle to convey the proper values of coins with ineffective instructional materials. This study aimed to create a more developmentally appropriate money model for students in grades K-3. Instruction included concrete and visual money models. The paper also presents a proportional model of money and creates a visual representation of coin equivalents to address the frustrations of both students and teachers. Implications for teachers and suggestions for classroom activities are discussed. (ASK)

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Teaching Money Concepts: Are We Shortchanging Our Kids?

Dyanne M. Tracy

Oakland University

Rochester, Michigan

Beverly H. Fanelli

Chippewa Valley Schools

Clinton Township, Michigan

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Teaching Money Concepts: Are We Shortchanging Our Kids?

Why do we teach money the way we do? No other math topic is as devoid of research and investigation into what is best for young children's learning. The concepts of teaching and learning money have been taught consistently throughout the history of education in the same way (Fanelli 1994). Our action research suggests that early childhood and lower-elementary educators need to re-think their approach to teaching money concepts.

Most primary teachers struggle to convey the proper values of coins with ineffective instructional materials. Learning the relative values of coins is difficult for most young children. Teachers must use a proportional model of money as advocated by Petty and Drum (1999) and Kennedy and Tipps (1998) to decrease student frustration and increase student learning. Creating a more developmentally appropriate money model for students in grades K-3 has been our goal for the past ten years. We have enhanced a proportional model of money (see fig. 1) and created a visual representation of coin equivalents (see fig. 2) to address the frustrations of both students and teachers.

Related Research

An electronic search of the Educational Research Information Clearinghouse (ERIC) revealed no classroom- or student-centered research investigating children's understanding of money. During the past 23 years, Teaching Children Mathematics (formerly Arithmetic Teacher) has published four articles related to the use of proportional, hands-on money models (Bradford 1980; Drum & Petty 1999; Ginaitis 1978; and Stevenson 1990). These authors observed improved student understanding of money concepts; however, they did not report data specific to student outcomes.

Summary of the Study

Children begin learning about money in informal settings such as when they use two silver circles and one larger silver circle to buy an ice cream treat. The fact that those colored circles represent legal tender and are parts of a dollar is beyond the comprehension of most primary children. This abstract nature of money makes it a difficult concept for them to learn.

In formal school settings teachers know that children need to begin concept understanding through the manipulation of hands-on materials as established by Piaget, Dienes, Bruner and as advocated in the Principles and Standards for School Mathematics: Discussion Draft (National Council of Teachers of Mathematics 1998). However, difficulties with money arise because most teachers are deceived by commercial "play money." The deception occurs because play money is only a reproduction of real money which is not proportional to a coin's value (see fig. 3).

When children learn with coins alone, they cannot determine the value of a set of coins unless they have already memorized each coin's worth. They also must have the ability to perform mental addition which requires place value understanding. When children learn with a concrete, proportional model of money, they can determine the value of a set of coins because the size of the model is directly related to its value as well as its relationship to one hundred parts or one hundred cents. This relationship can be further developed through a visual model that links coins' worth to the number of each coin needed to make one whole or one dollar. We hypothesized that using these two models, concrete and visual, in a curriculum to teach money would be more effective than traditional methods.

Our study in a large Midwestern metropolitan area included first and second graders at three elementary schools--two suburban and one urban. At the urban school, two first-grade

classrooms (n=43) used the concrete and visual money models. A third first-grade classroom used traditional teaching methods and were randomly pre- and post-tested (n=6) . In one suburban school second graders who had not yet mastered money concepts were referred to the first author for instruction with money models (n=17) . At the second suburban school, second graders were randomly selected for pretest and posttest purposes (n=6). The objectives for the money models and traditional groups were: recognizing coins, knowing coin names, knowing coin values, skip counting with the same coin, counting-on with coin combinations, and determining how many of each coin are needed to equal one dollar.

First grade. Prior to any formal instruction about money, students from two first-grade classrooms at an urban school were pretested in January. Instruction followed in small groups with four to six students each. Students cut out proportional dollars and watched as the first author cut fruit in matching fractional values. Emphasis was placed on the relationship between whole and part and the corresponding coin. For example, a grapefruit was cut into fourths and related to the proportional quarter dollar and the coin named "quarter." This sequence was repeated for all coins. The first author stressed the number of each coin equaling one dollar, how many cents each coin was worth, and how to skip count with one-dollar's worth of the same coin. Children consistently used the proportional and the visual models to construct money concepts. All students received four half-hour sessions over eight weeks. Students then completed a posttest.

Second Grade. After traditional classroom instruction on money, students from three second-grade classrooms at a suburban school were selected for further instruction based on their teachers' recommendations. These students were pretested for money concept understanding in February. The pretest score determined a placement group for each student-low, middle, or high.

Instruction followed in small groups with three to six students each. Students with little understanding of money followed the same prescription as the first-grade students above. Students with moderate understanding of money began instruction with the commercially produced MoneyIn~Mind™ proportional dollars and MoneyIn~Mind™: Coinline. Emphasis was placed on coins as fractional parts of a dollar, skip counting, and mixed-coin counting. Low and middle groups received seven half-hour sessions of instruction. Higher-ability students progressed through the same instruction as the middle students, but completed it in five half-hour sessions. Students then completed a posttest.

Research Findings

Qualitative Findings

The pretest revealed some fascinating insights into children's understanding of money especially related to coin recognition and coin values.

While examining coins, several students believed that the back of the dime had "paintbrushes" or "trees" on it. Others found "seagulls" on the back of the quarter, and one student saw an "alligator" on the back of the half-dollar! It was not uncommon to hear our famous monuments referred to as "houses" or "churches." As students examined coins, the first author mentioned looking at the heads and tails of the coins. Surprisingly, more than half of first graders did not comprehend this figurative language. They understood "tail" to mean the "tail of hair" on Washington's and Jefferson's wigs, which is actually the "head" of the quarter and nickel, respectively.

Although the penny was the most recognized coin, six students interpreted its worth as "nothing." Other children identified the value of the coin with what it could buy. For example, one child said a quarter was worth "a sucker," and another stated it was worth "some gum."

Quantitative Findings

While two entire first-grade classrooms participated in the money model instruction, the sample size is 29 due to absences during pre- or post-testing. Despite our inability to collect pretest data for the traditional first we believe our data offers valuable initial research findings into the learning of money concepts (see Table 1).

Individual analysis of posttest money concepts (see Table 2) for first graders shows near mastery of learning coin names. Their ability to match the corresponding value was somewhat lower. In skip counting with the same coin, first graders were accurate with pennies, applying the skill of one-to-one correspondence; however, they had more difficulty when using many-to-one correspondence as required with nickels, dimes, and quarters. Data indicate that students' ability to count-on with a variety of coins is low among second-semester, first-grade, urban students. Only 7 out of 35 students were successful in counting a set of mixed coins regardless of teaching method. Students' proficiency in determining the amount of coins in one dollar was higher among the money models group than the traditional group. Interestingly, only 35% of all first graders knew that one hundred pennies equaled one dollar. Moreover, only 34% of all the first graders correctly arranged the coins in order of value. Overall, a comparison of the traditionally instructed versus the money models groups revealed only a five point difference.

The posttest revealed that among second graders in the money models group, 100% could correctly skip count dimes in a set, nickels in a set, and pennies in a set; with quarters their proficiency was 67%. Their overall proficiency in skip counting was 92%. Data indicate that students' ability to count-on with a variety of coins is developmentally appropriate among second-semester, second-grade suburban students. On the four test items student scores ranged from 47%-93% correct, resulting in a score of 75%. In determining the amount of coins in one

dollar, second graders were at mastery level (87%). Further, every student could correctly arrange the coins in order of value.

Implications for Teachers. First-grade teachers should not expect mastery of money concepts. Both the traditional method and the money models group had an overall posttest score of less than 50%. As early as 1979, Hendrickson determined that entering first graders may not understand money relationships, but teachers and textbook authors assume they do.

About 2/3 of students at second semester, second grade have a good grasp of money concepts from traditional teaching methods. The 38% that do NOT understand money, need more than memorized procedures. If students are in the one-third that struggles, traditional money methods do not offer them developmentally appropriate methods. Our data show lower-money-ability students reaching mastery after using the concrete and visual models.

Suggestions for Classroom Activities

Coin recognition

- Use plastic magnifying glasses to encourage children to examine inscriptions and the details on coins.
- Include a coin rubbing activity to explore the details of coins and how they differ from one another.
- Purchase larger-than-actual-size reproductions of coins at teacher supply centers to enhance whole-group instruction.
- Encourage students to scratch the edges (smooth vs. ridged) of coins to further distinguish a nickel from a quarter.
- Explain the opposite meaning of "heads" and "tails" by connecting it to prior knowledge such as "on/off," "fast/slow," etc. This is especially important with the current minting of

fifty different tails for the quarter!

Skip Counting

- Using proportional model coins (see fig. 3) cover the hundred grid and allow students to "peek" if needed.

Counting On

- With proportional model coins (see fig. 3), cover the hundred grid with mixed pieces to allow students to check their mental math and build their confidence.

Dollar Equivalents

- Provide students graph paper to color and cut their own proportional money set. Emphasize the number of each proportional coin necessary for one dollar. Cutting out 100 square centimeters could be a valuable experience for your 100 Day Celebration.
- Permanently display the visual model (see fig. 2) and count the number of coins on one line aloud. Compare and contrast the number of coins on each line.

Arrangement of Coins in Order by Value

Physically arrange the proportional model coins by size. Match real or play coins to the model pieces. Highlight the unnatural order of the real (play) coins.

Conclusions

Our investigation of this topic over the past decade leads us to believe that traditional methods for teaching money can be improved. If teachers incorporate concrete and visual money models, more students can master money concepts.

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Table 1

Money Concepts Pretest and Posttest Scores in Percents Successful

	Pretest	Posttest
First Grade		
Money Models	23.5	48.5
Traditional	--	43.8
Second Grade		
Money Models	62.8	91.2
Traditional	62.5	84.2

Table 2

Posttest Analysis by Curriculum Objective (% correct)

	First Grade		Second Grade	
	Money Models	Traditional	Money Models	Traditional
Coin Name (5 items)	75%	73%	95%	83%
Coin Value (5 items)	61%	50%	95%	100%
Skip Counting (4 items)	50%	45%	92%	75%
Counting On (4 items)	16%	29%	75%	89%
Number of Coins in a Dollar (5 items)	46%	20%	87%	74%
Arrange in Order (1 items)	34%	33%	100%	--------
All Money Concepts	49%	44%	91%	84%

1	6	11	16	21	26	31	36	41	46	51	56	61	66	71	76	81	86	91	96
2	7	12	17	22	27	32	37	42	47	52	57	62	67	72	77	82	87	92	97
3	8	13	18	23	28	33	38	43	48	53	58	63	68	73	78	83	88	93	98
4	9	14	19	24	29	34	39	44	49	54	59	64	69	74	79	84	89	94	99
5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

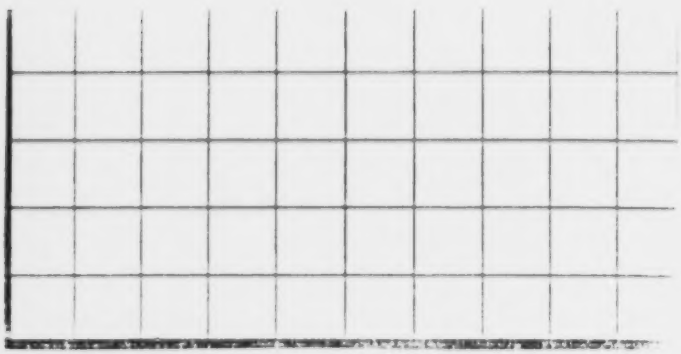
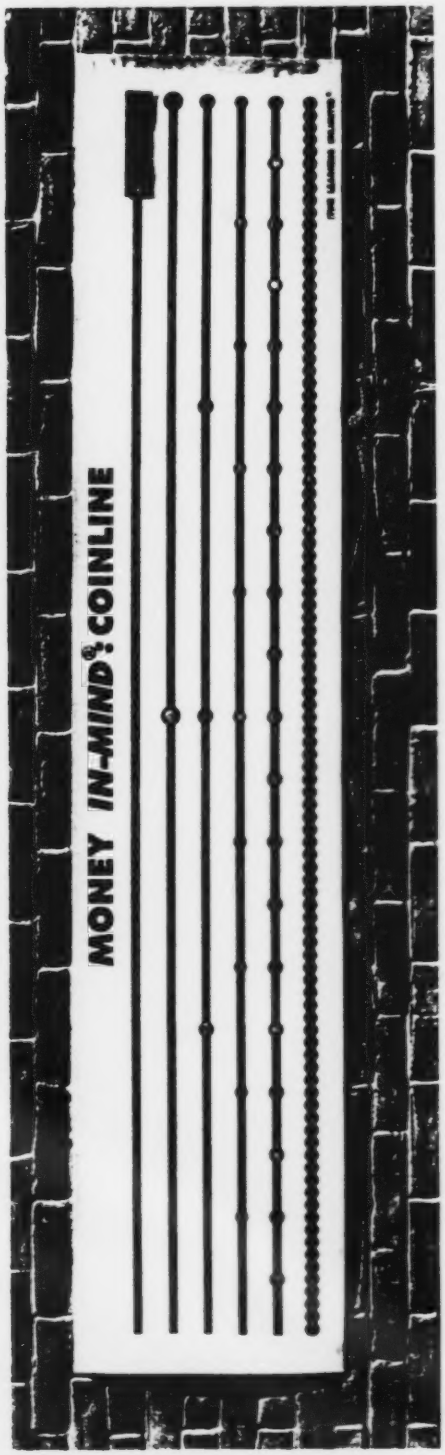


Figure 2. Visual Representation of Coin Equivalents.



			41	46	51	56	61	66	71	76	81	86	91	96
			42	47	52	57	62	67	72	77	82	87	92	97
			43	48	53	58	63	68	73	78	83	88	93	98
			44	49	54	59	64	69	74	79	84	89	94	99
			45	50	55	60	65	70	75	80	85	90	95	100